

Analysis of Allocative Efficiency of Watermelon Farming in Kapuas Regency, Central Kalimantan Province

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ABSTRACT

The objective of this research is to analyze the costs, revenues, and profits of watermelon farming, to examine the impact of the use of production factors in watermelon farming, and to evaluate the allocative efficiency level of watermelon farming in Kapuas Regency, Central Kalimantan Province. The population of this research consists of 113 farmers, from which 55 were selected using simple random sampling techniques. The data processing method used to analyze the costs, revenues, and profits of watermelon farming includes using a multiple linear regression model, specifically the Cobb-Douglas function type. Additionally, to analyze the allocative efficiency of production factors used by farmers in watermelon farming, the comparison of a production factor's Marginal Product Value (MPV_x) with the price of the production factor (P_x) is set to be equal to 1. Based on the results of the research and data processing, the average revenue obtained from watermelon farming in Kapuas Regency is IDR 75,619,181.82 per farm, and the average profit earned by watermelon farmers is IDR 45,541,259 per farm. The statistical test results of the Cobb-Douglas production function show that collectively (simultaneously), the production factors (land area, number of seeds, organic fertilizer, inorganic fertilizer, pesticides, and labor) significantly affect watermelon production. However, the partial test results indicate that the production factors of land area, seeds, organic fertilizer, inorganic fertilizer, and labor significantly affect watermelon production, except for the production factor of pesticides. The statistical test results for allocative efficiency (price efficiency) show that three production factors, namely organic fertilizer, labor, and pesticides, are used efficiently, meaning the marginal product equals the price of the production factor. The use of land area, seeds, and inorganic fertilizer is not yet efficient and needs to be increased to reach an efficient point.

Keywords: Allocative efficiency, Production factors, Watermelon.

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1. INTRODUCTION

Considering that Indonesia is an agrarian country, its economy heavily relies on agriculture. Watermelon is a horticultural commodity with great development potential. This can increase national income and improve the living standards of the people. Horticultural commodities are among the most promising commodities [1]. Fruits, like many other horticultural commodities, have significant production potential and favorable market conditions, making them an attractive gateway for both local and

international markets. Farmers are interested in planting watermelon due to its higher selling price. The high demand for watermelon is often unmet by farmers due to limited cultivation in Indonesia [2].

The use of production inputs must be efficient to achieve optimal production. Farmers need to pay attention to the efficiency of input usage when conducting farming activities to achieve optimal production. Efficiency is the method in the production process that minimizes the use of production inputs to produce the maximum output [3].



One of the problems faced by watermelon farmers related to cultivation is the ineffective allocation of production inputs, which results in the inability to maximize farmers' income [4]. This is because farmers do not fully understand how agricultural inputs and outputs are distributed. Insufficient or excessive production inputs can lead to watermelon harvests that do not meet the farmers' expectations.

One of the challenges in watermelon farming in Kapuas Regency is the business capital and the susceptibility to pests and diseases compared to other horticultural crops. To reduce the number of pests and diseases in watermelons, farmers use pesticides as a preventive solution [5]. Additionally, farmers usually use inorganic fertilizers to enhance the resilience of watermelon plants and maintain the quality of the fruit produced [6]. However, from an economic perspective, this increases production costs due to the prices of production inputs and labor wages, impacting the profits of watermelon farmers in Kapuas Regency. As a result, watermelon farmers must optimize the production factors used to maximize their profits.

1.1. Objectives and Benefits

There are three objectives in this research. First, to analyze the costs, revenues, and profits of watermelon farming in Kapuas Regency. Second, to analyze the impact of the use of production factors. Third, to analyze the allocative efficiency of production factors in watermelon farming.

This research has four benefits. First, it serves as a reference material focusing on the allocative efficiency of watermelon farming. Second, for the community, this research is expected to provide valuable information for those engaged in watermelon farming, helping them use their production factors more efficiently. Third, it offers considerations for farmers to organize their watermelon farming to achieve efficient production.

2. METHODS

2.1. Location and Time of Research

This research was conducted in Kapuas Regency, Central Kalimantan Province. The study was carried out from February to April 2024.

2.2. Types and Sources of Data

The primary data used in this research was obtained through direct interviews with watermelon farmers. Additionally, secondary data were required to support the primary data, which were obtained from literature studies and relevant institutions or agencies.

2.3. Sampling Method

The sample locations were purposively selected in the first stage, meaning the research locations in Kapuas Murung District and Mantangai District were chosen based on specific considerations. These considerations included the presence of active watermelon farmers with high productivity and large land areas in both districts.

The selection of respondents (sample) used in this research was based on data obtained from the Agricultural

Extension Centers (BPP) Kapuas Murung District and Mentangau District. The total population of watermelon farmers was 113. From this population, 55 were selected using simple random sampling techniques.

2.4. Data Analysis

To analyze the first objective, which is to calculate the total costs, revenues, income, and profits of watermelon farming, the following calculations were performed.

To calculate the total cost (Total Cost), it is obtained by summing the fixed costs (Fixed Cost/FC) with the variable costs (Variable Cost) using the formula:

$$TC = TFC + TVC$$

where

TC – Total cost of farming in the farming period (IDR)

TFC – Fixed cost (IDR)

TVC – Variable cost (IDR)

$Dirti$ – Depreciation

The revenue from watermelon farming can be calculated using the following formula:

$$TR = Y \times Py$$

where

TR – Total revenue (IDR)

Y – Production obtained from watermelon farming (kg)

Py – Price of watermelon (IDR/kg)

The profit from watermelon farming in one season can be calculated using the formula:

$$\pi = TR - TC$$

where

π – Farming profit (IDR)

TC – Total cost of farming (IDR)

To achieve the second objective of this research, which is to understand the impact of various production factors on watermelon farming, a multiple linear regression model, specifically the Cobb-Douglas function model, was used:

$$Y = b_0 X_1^{b_1} X_2^{b_2} X_3^{b_3} X_4^{b_4} X_5^{b_5} X_6^{b_6} X_7^{b_7} e_u$$

The model, when transformed into a linear form, is as follows:

$$\begin{aligned} \ln Y = & \ln \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 \\ & + \beta_5 \ln X_5 + \beta_6 \ln X_6 + \beta_7 \ln X_7 e_i \end{aligned}$$

where

Y – Watermelon production (kg)

X_1 – Land area (ha)

X_2 – Number of seeds (kg)

X_3 – Amount of organic fertilizer (kg)

X_4 – Amount of inorganic fertilizer (kg)

X_5 – Amount of pesticides (liters)

X_6 – Amount of labor (man-days)

B_0 – Intercept coefficient or constant

$\beta_1 \beta_2 \beta_3 \beta_4 \beta_5 \beta_6$ – Regression coefficients

e_i – Random error term

To understand the effect of various factors on the final product, the coefficient of determination (R^2) is used:

$$R^2 = \frac{KT_{regression}}{KT_{total}}$$

The F-test, which has a 95% confidence level, can be used as follows:

$$F_{calculated} = \frac{KT_{regression}}{KT_{residual}} = \frac{\sum \hat{Y}_i^2 / k}{\sum \hat{e}_i^2 / n - k - 1}$$

Hypothesis are:

- $H_0: b_i = 0$
- $H_1: b_i \neq 0$

Decision criteria are:

1. $F_{calculated} > F_{table} (\alpha; n - k)$: H_0 is rejected, and H_1 is accepted, indicating that all production factors collectively have a significant effect on production.
2. $F_{calculated} \leq F_{table} (\alpha; n - k)$: H_1 is rejected, and H_0 is accepted, indicating that all production factors collectively do not have a significant effect on production.

The t-test, with a confidence level of 95% or $\alpha = 0.05$, can be formulated as:

$$t_{calculated} = \frac{b_i}{Se_{(b_i)}}$$

where

b_i – i^{th} regression coefficient

$Se_{(b_i)}$ – Standard error of the standard error of the i^{th} regression coefficient

Decision criteria are:

1. $F_{calculated} > F_{table} (\alpha = 0.05)$: H_0 is accepted, and H_1 is rejected, indicating that the production factor X_i does not have a significant effect on production.
2. $T_{hitung} > T_{tabel} (\alpha = 0.05)$: H_1 is accepted, and H_0 is rejected, indicating that the factor X_i has a significant effect on production.

The third objective can be achieved by analyzing the allocative efficiency of the production factors used by farmers in watermelon farming. To address the third objective, the Marginal Product Value (MPV_x) of the production factors is compared with the price of the production factors (P_x), aiming for the ratio to be equal to 1.

$$\frac{NPM_{xi}}{P_{xi}} = 1$$

where

NPM_{xi} – Marginal product value of the production factor X_i

P_{xi} – Price of the production factor X_i

If the value of NPM_{xi}/P_{xi} for each production factor is equal to one, it means the production factor X_i is used optimally. Conversely, if the value of NPM_x/P_x for each production factor is different from one, it means the use of the production factor X does not achieve economic efficiency.

3. RESULTS AND DISCUSSION

3.1. Characteristics of Respondents

The respondents in this research are farmers engaged in watermelon farming in Kapuas Murung District and Mentangai District. A total of 55 farmers were sampled. The general characteristics of the respondents in this study include the age of the farmers, their education level, farming experience, and the number of family dependents (Table I). This general overview describes the characteristics of the farmers.

3.1.1. Farmer Age

Based on the research results, the average age of watermelon farmers shows that the largest age group is 46–55 years, with 18 farmers (36.4%), while the smallest age group is over 35 years, with 3 farmers (5.5%). The younger the farmers, the more likely they are to perform farming tasks themselves, thus reducing the cost of external labor. Conversely, the older the farmers, the lower their work capacity, decision-making, and behavior in planting watermelons due to their physical condition. However, the older the farmers, the more significant the impact of their farming experience on their management behavior.

3.1.2. Education Level

Based on the research results, 70.9% of watermelon farmers have a low level of education, as most have only completed elementary to junior high school, with some farmers not having any formal education. The remaining 25.5% have completed senior high school.

3.1.3. Farming Experience

Based on the research results, the highest farming experience among respondent farmers is between 11 and 20 years, with 27 farmers (49.1%), while the lowest farming experience is over 20 years, with 7 farmers (12.7%). With a high level of farming experience, a farmer can manage their farming operations effectively.

3.1.4. Number of Family Dependents

Based on the research results, the number of family dependents among watermelon farmers ranges from 1 to 6 people. The majority of watermelon farmers have 3–4 family dependents, with 26 farmers (47.3%). The smallest number of family dependents is 5–6 people, with 5 farmers (9.1%). This is because many of the farmers' children who are married move out to their own homes. The number of family members can influence the household income level.

3.2. Costs, Revenue, and Profit of Watermelon Farming

3.2.1. Fixed Costs

Fixed costs are expenses that do not depend on the volume of output. Based on the research results, the fixed costs of watermelon farming with an average land area of 1.54 hectares amount to an average of IDR 1,999,937 per farm or IDR 1,273,255 per hectare. The largest portion of these costs is spent on interest on capital, which accounts for 53.8% (Table II). This is due to the significant total costs incurred, with an interest rate on KUR (People's

TABLE I: DISTRIBUTION OF RESPONDENT CHARACTERISTICS

Respondent characteristics	Number (people)	Percentage (%)
Based on age (years)		
>35	3	5.5
36–45	14	25.5
46–55	18	36.4
>55	20	32.7
Education level		
Did not complete elementary school or equivalent	2	3.6
Completed elementary school or equivalent	29	52.7
Completed junior high school or equivalent	10	18.2
Completed senior high school or equivalent	14	25.5
Farming experience (years)		
5–10	21	38.2
11–20	27	49.1
>20	7	12.7
Family dependents (people)		
1–2	24	43.6
3–4	26	47.3
5–6	5	9.1

TABLE II: AVERAGE DEPRECIATION COSTS OF FARMING EQUIPMENT IN WATERMELON FARMING

No	Cost component	Per farm (IDR)	Per hectare (IDR)	Percentage (%)
1	Equipment depreciation	424,928	270,529	21.2
2	Land and building tax	48,019	30,571	2.4
3	Maintenance costs	170,000	108,230	8.5
4	Bank interest	1,076,727	685,496	53.8
5	Tractor rental	280,263	178,429	14.0
	Total	1,999,937	1,273,255	100

TABLE III: AVERAGE TOTAL COST OF WATERMELON FARMERS

No	Cost component	Per farm (IDR)	Per hectare (IDR)	Percentage (%)
1	Fixed costs	1,999,937	1,273,255	6.32
2	Variable costs	29,652,995	18,878,513	93.68
	Total	31,652,932	20,151,768	100

Business Credit) of 6% per year. The smallest cost is PBB (Land and Building Tax), which accounts for 2.4%.

3.2.2. Total Cost

All fixed and variable costs incurred by farmers when cultivating watermelons in one growing season are added to the total cost.

Based on the research results, the total cost of watermelon farming is on average IDR 31,652,932 per farm or IDR 20,151,768.29 per hectare (Table III). Of this amount, the largest cost is variable costs, which account for 98.59%. This is due to the dependency on the scale of the farming operation, requiring significant input or production facilities.

3.2.3. Revenue

Based on the research, the average watermelon production per farm is 14,370 kg per year, with an average price of IDR 5,145 per kg. Based on the production and selling price per unit of production, the average revenue from watermelon farming is IDR 73,892,500 per farm, with an average revenue per hectare of IDR 48,142,783 per hectare (Table IV).

3.2.4. Profit

Based on the research conducted over one growing season in watermelon farming, with a revenue of IDR 73,892,500 per farm and an average revenue per hectare of IDR 48,142,783, and the total costs incurred by watermelon farmers amounting to IDR 30,077,923 per farm and IDR 19,149,042 per hectare, the profit obtained is IDR 45,541,259 per farm and IDR 28,993,740 per hectare (Table V).

3.2.5. The Effect of Production Factors on Watermelon Farming

To determine the effect of production factors in watermelon farming, estimation was conducted using a Cobb-Douglas function regression analysis model, yielding the following results:

$$\begin{aligned} \ln Y = & 3.888 + 0.175 \ln X_1 + 0.106 \ln X_2 + 0.167 \ln X_3 \\ & + 0.423 \ln X_4 + 0.029 \ln X_5 + 0.249 \ln X_6 \end{aligned}$$

Based on the F-test, the computed F-value (64.567) with a probability value of $0.000 < 0.05$ ($\alpha = 5\%$), indicates that the null hypothesis H_0 is rejected and H_1 is accepted. This

TABLE IV: REVENUE FROM WATERMELON FARMING

No	Description	Per farm (IDR)	Per hectare
1	Production (kg)	14,370	9,149
2	Price of watermelon (IDR/kg)	5,145	5,145
	Revenue (IDR)	75,619,181.82	48,142,783

TABLE V: WATERMELON FARMING PROFIT

No	Description	Per farm (IDR)	Per hectare
1	Revenue	75,619,182	48,142,783
2	Total costs	31,565,432	20,096,062
	Profit	44,053,750	28,046,721

TABLE VI: REGRESSION ANALYSIS RESULTS OF PRODUCTION FACTORS AFFECTING PRODUCTION

Model	Unstandardized coefficients		t	Sig	Collinearity statistics	
	B	Standard error			Tolerance	Vif
Production (Y)	3.888	0.635	6.124	0.000		
Land area (X ₁)	0.175	0.103	1.706	0.094	0.336	2.979
Seeds (X ₂)	0.106	0.054	1.961	0.056	0.966	1.035
Organic fertilizer (X ₃)	0.167	0.095	1.752	0.086	0.214	4.670
Inorganic fertilizer (X ₄)	0.423	0.084	5.050	0.000	0.271	3.691
Pesticides (X ₅)	0.029	0.034	0.865	0.391	0.927	1.079
Labor (X ₆)	0.249	0.093	2.666	0.010	0.331	3.020

R²-Adjusted = 0.876; F-hit = 64,567; p = 0.000

suggests that the land area (X_1), seed quantity (X_2), organic fertilizer amount (X_3), inorganic fertilizer amount (X_4), pesticide quantity (X_5), and labor input (X_6) collectively have a significant influence on watermelon production (Y).

3.2.6. T-test

The t-test is used to test the coefficients of the following variables in this research regression equation: land area (X_1), seed quantity (X_2), inorganic fertilizer amount (X_4), organic fertilizer amount (X_3), pesticide quantity (X_5), and labor input (X_6), which are the variables in this research regression equation. Watermelon production (Y) is the dependent variable here, and it is aimed at determining which independent variables significantly affect it. Here's an explanation for each of these variables:

3.2.7. Production Factor Land Area (X_1)

The variable of seed quantity significantly affects watermelon production, as indicated by the t-test result ($t = 1.706$) (Table VI) with a probability value of $0.094 < 0.1$ ($\alpha = 10\%$). Therefore, H_1 is accepted, and H_0 is rejected, meaning that land area has a significant effect on watermelon production at a 10% significance level. In other words, an increase in land area by 1% can effectively increase watermelon production by 0.175%.

3.2.8. Production Factor Seed Quantity (X_2)

The variable of seed quantity significantly affects watermelon production, as indicated by the t-test result ($t = 1.961$) (Table VII) with a probability value of $0.056 < 0.1$ ($\alpha = 10\%$). Therefore, H_1 is accepted, and H_0 is rejected, meaning that seed quantity has a significant effect on watermelon production at a 10% significance level.

In other words, an increase in seed quantity by 1% can effectively increase watermelon production by 0.106%.

3.2.9. Production Factor Quantity of Organic Fertilizer (X_3)

The variable of quantity of organic fertilizer significantly affects watermelon production, as indicated by the t-test result ($t = 1.752$) with a probability value of $0.086 < 0.1$ ($\alpha = 10\%$) (Table VI). Therefore, H_1 is accepted, and H_0 is rejected, meaning that the quantity of organic fertilizer has a significant effect on watermelon production. In other words, an increase in the quantity of organic fertilizer by 1% can effectively increase watermelon production by 0.167%.

3.2.10. Production Factor Quantity of Inorganic Fertilizer (X_4)

The variable of quantity of inorganic fertilizer significantly affects watermelon production, as indicated by the t-test result ($t = 5.050$) with a probability value of $0.000 < 0.01$ ($\alpha = 1\%$) (Table VI). Therefore, H_1 is accepted, and H_0 is rejected, meaning that the quantity of inorganic fertilizer has a significant effect on watermelon production. In other words, an increase in the quantity of inorganic fertilizer by 1% can effectively increase watermelon production by 0.423%.

3.2.11. Production Factor Quantity of Pesticides (X_5)

This is evident from the t-test that the variable quantity of pesticides does not have a significant effect on watermelon production ($t = 0.865$) with a probability value of $0.39 > 0.1$ ($\alpha = 10\%$) (Table VI). This indicates that the quantity of pesticides does not significantly affect watermelon production. Hence, H_0 is accepted, and H_1 is rejected.

TABLE VII: ALLOCATIVE EFFICIENCY VALUES IN WATERMELON FARMING

No.	Independent variable	NPM_{xi}	P_{xi}	K_i	T_{hit}	Description
1	Land (X_1)	8,240,438	35,000,000	0.23	7.596	Not efficient
2	Seed quantity (X_2)	31,390	205,000	0.15	10.897	Not efficient
3	Organic fertilizer (X_3)	1,712	480	3.56	1.289	Efficient
4	Inorganic fertilizer (X_4)	31,963	11,825	2.70	3.171	Not efficient
5	Pesticides (X_5)	241,161	83,375	2.89	0.577	Efficient
6	Labor (X_6)	136,044	100,000	1.36	0.708	Efficient

3.2.12. Production Factor Quantity of Labor (X_6)

The variable quantity of labor significantly affects watermelon production, as evidenced by the t-test result ($t = 2.666$) with a probability value of $0.010 < 0.1$ ($\alpha = 10\%$). Therefore, H_1 is accepted, and H_0 is rejected, meaning that the quantity of labor has a significant effect on watermelon production. In other words, an increase in labor quantity by 1% can increase watermelon production by 0.249%.

3.2.13. Analysis of Allocative Efficiency of Production Factors in Watermelon Farming

Based on the research findings, it is evident that the use of organic fertilizer, pesticides, and labor in watermelon farming is efficient. However, the use of land area, seeds, and inorganic fertilizers is still inefficient.

3.2.14. Production Factor Land Area

The land area has a marginal productivity value (NPM_{x1}) of IDR 8,240,438. The price of land area as a production factor (P_{x1}) is IDR 35,000,000 per hectare. The NPM_{x1} value indicates that each additional hectare of cultivated land for watermelon farming would increase revenue by IDR 8,240,438. The price efficiency index (K_i) between the marginal product of land area (NPM_{x1}) and the price of land area (P_{x1}) is 0.23, with a t-value (7.596) $>$ t-table (1.676) at $\alpha = 5\%$. Therefore, H_1 is accepted, and H_0 is rejected, meaning that land area is inefficiently used (Table VII).

3.2.15. Production Factor Seed Quantity

Seeds have a marginal productivity value (NPM_{x2}) of IDR 31,390. The price of seeds as a production factor (P_{x2}) is IDR 205,000 per gram. Based on this NPM_{x2} figure, each additional kilogram of seeds used to manage watermelon production will generate an increase in revenue of IDR 31,390. With a t-value (10.897) $>$ t-table (1.676) at $\alpha = 5\%$, the price efficiency index (K_i) between the price of seed quantity (P_{x2}) and the marginal product of seed quantity (NPM_{x2}) is 3.07. The rejection of H_0 and acceptance of H_1 indicate that seeds are inefficiently used.

3.2.16. Production Factor Organic Fertilizer

Organic fertilizer has a marginal productivity value (NPM_{x3}) of IDR 1,717. The price of organic fertilizer as a production factor (P_{x3}) is IDR 480 per kilogram. The NPM_{x3} value indicates that each additional kilogram of organic fertilizer used for watermelon farming would increase revenue by IDR 1,717. With a t-value (1.289) $<$ t-table (1.676) at $\alpha = 5\%$, the price efficiency index (K_i) between the price of organic fertilizer (P_{x3}) and the marginal product of organic fertilizer (NPM_{x3}) is 3.56. The

fact that H_0 is accepted and H_1 is rejected indicates that organic fertilizer is efficiently used.

3.2.17. Production Factor Inorganic Fertilizer

Inorganic fertilizer has a marginal productivity value (NPM_{x4}) of IDR 31,963. The price of inorganic fertilizer as a production factor (P_{x4}) is IDR 11,825 per kilogram. This NPM_{x4} value means that each additional kilogram of inorganic fertilizer used in watermelon farming will increase revenue by IDR 31,963. With a t-value (3.171) $>$ t-table (1.676) at $\alpha = 5\%$, the price efficiency index (K_i) for inorganic fertilizer is 2.70. Therefore, the rejection of H_0 and acceptance of H_1 indicate that inorganic fertilizer is inefficiently used.

3.2.18. Production Factor Pesticides

The marginal productivity value (NPM_{x5}) of pesticides is IDR 241,161. The price of pesticides as a production factor (P_{x5}) is IDR 83,375 per liter. Based on this NPM_{x5} value, each additional liter of pesticides used for watermelon cultivation will increase revenue by IDR 241,161. With a t-value (0.577) $<$ t-table (1.676) at $\alpha = 5\%$, the price efficiency index (K_i) for pesticides is 2.89. Therefore, the acceptance of H_0 and rejection of H_1 indicate that pesticides are efficiently used.

3.2.19. Production Factor Labor

Labor has a marginal productivity value (NPM_{x6}) of IDR 136,044. The price of labor as a production factor (P_{x6}) is IDR 100,000 per HOK (Working Day). This NPM_{x6} value means that each additional use of labor for watermelon farming by one HOK will increase revenue by IDR 136,044. The price efficiency index (K_i) between the marginal product of labor quantity (NPM_{x6}) and the price of labor quantity (P_{x6}) is 1.36, with a t-value (0.708) $<$ t-table (1.676) at $\alpha = 5\%$. Therefore, the acceptance of H_0 and rejection of H_1 indicate that labor is efficiently used.

4. CONCLUSION AND RECOMMENDATIONS

4.1. Conclusion

1. The average cost incurred in watermelon farming is IDR 31,652,932 per farm. The average revenue obtained from watermelon farming in Kapuas Regency is IDR 75,619,181.82 per farm, and the average profit earned by watermelon farmers is IDR 45,541,259 per farm.
2. The results of the Cobb-Douglas production function analysis indicate that production factors, including land area, seed quantity, organic fertilizer,

inorganic fertilizer, pesticides, and labor, collectively (simultaneously) have a significant effect on watermelon production. Conversely, partial testing shows that five production factors—land area, seed quantity, organic fertilizer, inorganic fertilizer, and labor—have a significant effect on production, while pesticides do not have a significant effect.

3. In the efficiency analysis, three production factors—organic fertilizer, labor, and pesticides—are used efficiently, where their marginal product equals the factor input price. However, the use of land area, seeds, and inorganic fertilizer is inefficient and needs to be increased to achieve efficiency.

4.2. Recommendations

Based on the results of watermelon farming research in Kapuas Regency:

1. Farmers are encouraged to pay closer attention to the use of production factors that significantly affect watermelon yields. Increasing productivity will enhance watermelon production, resulting in greater profits.
2. The use of pesticides should strictly adhere to guidelines and recommended procedures. It is advisable to apply pesticides according to the recommendations of agricultural extension services in watermelon farming operations.
3. The Kapuas Regency agricultural department should provide intensive cultivation guidance to local farmers, particularly focusing on seedling techniques. This support will help them develop their farming practices effectively.

CONFLICT OF INTEREST

The authors declare that they do not have any conflict of interest.

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